EUR 7257 EN

COMMISSION OF THE EUROPEAN COMMUNITIES

Multiannual Programme
of the Joint Research Centre
1980-1983

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Annual Status Report

Protection of the environment

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PROTECTION OF THE ENVIRONMENT

1980

Research Staff: 90 men-year
Budget: 8.375.000 ECU

Projects:

- ECDIN: Environmental Chemicals Data Information Network
- Exposure to Chemicals:
  Indoor Pollution
  Chemical Products (Organics)
- Air Quality
- Water Quality
- Heavy Metal Exposure and Health Effects:
  I.L.E. (Isotopic Lead Experiment)
  Exposure to Heavy Metals and Health Effects
- Environmental Impact of Conventional Power Plants

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1. INTRODUCTION

The principal scope of this programme is to provide together with the Indirect and Concerted Action Programmes, scientific support to the Community's Action Programme on the Environment (1977-81). The following table gives a synoptic view of the major links of the Action Programme managed by the SECP (Service of Environment and Consumer Protection) at Brussels and the related research programmes.

Since the decision for the new multiannual (1980-83) programme came only in March 1980, the activities of the previous programme period were continued through the first half of the year and a rather smooth reorentation towards the objectives of the new programme took place.

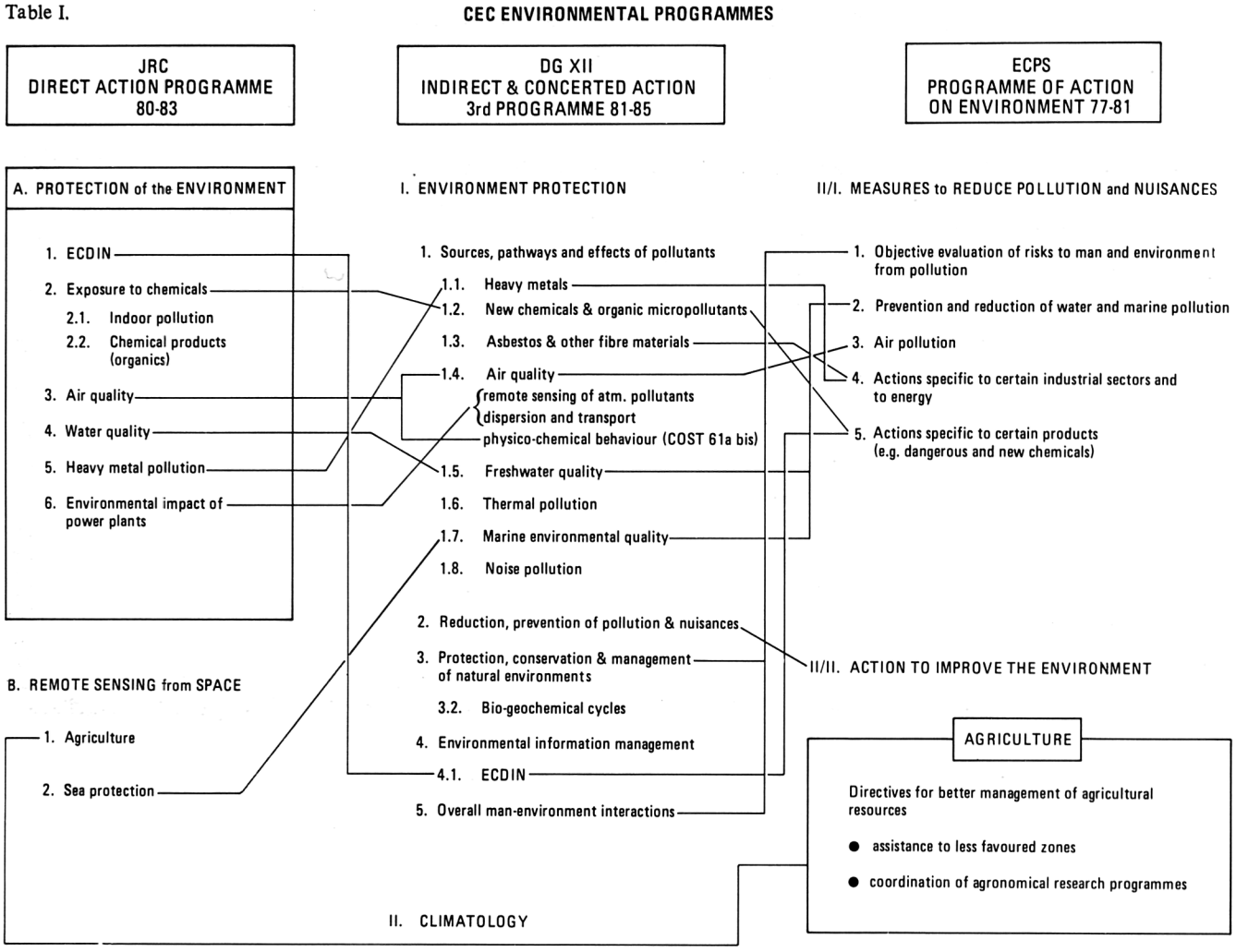
The chemical activities of the environmental research at the JRC - Ispra have been progressively reoriented towards a new centre of gravity, i.e. "environmental chemicals". In this context the project ECDIN, a databank on environmental chemicals will play a more important role in orienting the other chemical "laboratory" projects towards a common goal. For the immediate future ECDIN continues to pursue objectives from the previous programme with an increasing effort in research staff and funds.

Striking differences in the air pollution level inside and directly outside of private houses and public buildings led to the conception of the "Indoor Pollution" project. The study will be focused on organic emissions in private houses, school rooms and department stores. The final objective is to reconsider the relevance of air quality standards.

The title "Chemical Products (Organics)" is related to the activities of a research group at the Petten Establishment, which have been reoriented from the former programme METRE ("Measurements, Standards and Reference Techniques"). This research is aiming towards the identification of carcinogenic chemicals mainly originating from fossil fuel technologies, in the environment and in working areas, to promote their toxicological testing and to supply physicochemical data (spectra) for their analytical detection and control. Another study concerns some basic research with a view to reduce the release of toxic additives from plastics into packed foods and into the environment after use.

"Air Quality" is a follow-up of the former project "Particle formation and transport of pollutants". It deals with analysis of atmospheric pollutants, chemical and photochemical reaction. It is integrated into the COST 61 bis action "Physicochemical behaviour of atmospheric pollutants".

Table I.



The project "Water Quality" focuses on the mass balance of nutrients in lakes, a special physico-chemical modellistic approach from the former more general studies on eutrophication and on the use of bioindicators for the characterization of water pollution.

Studies on "Heavy Metals" comprise the conclusion of the ILE project and extend the assessment studies around conventional fossil fuelled power plants to other heavy metal pollution sources like incinerators and fertilizers.
Metallobiochemistry will be the key method to elucidate the pathway of these pollutants.

"The Environmental Impact of Power Plants" project deals with the diffusion and transport of emissions (gaseous and particulate) from conventional power plants. In the future more emphasis is put on micrometeorological aspects of sites and the study of mesoscale transport by means of advanced tracer techniques. The input-output balance of pollutants in industrial or urban areas will be related to these topics. The project is fully integrated in similar national and Community wide projects.

2. RESULTS

ECDIN (Environmental Chemicals Information Network)

During 1980 a major component of the future operational ECDIN was completed. This component, known as the ECDIN update system, is a piece of software which will ensure quality control of the data at the time that these data are loaded into the ECDIN ADABAS data base.
The system is flexible and will allow changes in input formats and data base design to be handled without the need to rewrite the software. It is likely to be useful for applications outside the ECDIN projct.

Considerable progress was made with the EINECS (European Inventory of Existing Commercial Chemical Substances) inventory last year. In this work the Joint Research Centre (and in particular the ECDIN project team) has been acting as an internal technical consultant for the Environment and Consumer Protection Service, the part of the Commission responsible for EINECS. The ECDIN group has prepared several

proposals for the European Core Inventory (ECOIN) on the basis of analyses made using three existing files:

a. US inventory prepared for the Toxic Substances Control Act
b. SRI Directory of Chemical Producers - Western Europe
c. Custom's Union List of substances

The proposal selected by the EINECS Inventory Working Group contained some 34.000 substances and the ECDIN group has collaborated with the Chemical Abstracts Service to prepare the publication of ECOIN in 1981.
The procedures for the preparation of EINECS developed by the ECDIN group in collaboration with ECPS have also been approved by the Inventory Working Group.

Preparations for an experimental ECDIN service on EURONET-DIANE have made considerable progress during the year. The JRC - Ispra computer is connected to EURONET-DIANE as a host computer and initial experiments testing the access to ECDIN from various parts of Europe have been successfully completed.

INDOOR POLLUTION

The start of this new activity has been delayed by two factors: the late decision of the 1980-83 program and the fact the personal in charge of the execution of this activity has still been mainly involved in terminating outrunning activities (like "Cost 64b-bis and Ozone Depletion by halocarbons and Other Substances").

Thus the activity was essentially limited to establish an initial working program. It includes two major activities: Establishment of organic pollution "profiles" in some typical indoor environments and measurement of the exposure of representatives of selected population groups to organic indoor air pollution and comparison of indoor and outdoor air pollution exposure.

Analysis of organic micropollutants (Cost 64b-bis)

The most important scope of this European research action is to develop analysis methods for unknown organic water pollutants. This analysis requires essentially a combination of a method which separates the complex mixture of organic compounds in water into its single components and another method which characterises them in a unique way. For the time being mass spectrometry is the only method for an unique characterization of unknown organic water pollutants which fits the inherent requirements of sensitivity, non-selectivity and specificity.
For separation two complementary techniques are available: gas chromatography (GC) and high pressure liquid chromatography (HPLC). The first method can be applied to fairly volatile and thermally stable compounds only (group 1) and it can be easily directly coupled to a mass spectrometer. Low or non volatile and/or thermally labile compounds (group 2) can be separated by HPLC only. This technique, however, presents considerable, yet unresolved problems with respect to a combination with mass spectrometry. Unfortunately 80 - 90% of organic water pollutants belong to group 2.

Our 1980's contribution to the Cost 64b-bis action consisted in two activities:

1. For the analysis of group 1 compounds we developed a method which allows to calculate with increased reproducibility a parameter of GC separation, the so-called retention index, which has a characteristic value for each compound. The method uses a computer assisted polynomial interpolation procedure and is particularly useful to identify isomeric compounds with similar mass spectra.
2. We installed and tested the first commercially available interface for a direct coupling of an HPLC and MS instrument. Two major limitations resulted with respect to its applicability to the analysis of group 2 compounds. The interface allows only the analysis of the more volatile and thermally stable fraction of the group 2 compounds. Analytical sensitivity is rather limited by the considerable chemical background which is transported out of the interface into the mass spectrometer.
   Our activities in the field of water pollution analysis have essentially been terminated. In the framework of the Support to the Commission Services we will continue to give a contribution to the Cost 64b-bis action coordination and will participate in a ring analysis of a real water extract.

Ozone depletion

The results of the mathematical models developed for the prediction of the effect of anthropogenic activities, in particular halocarbon release, on the stratospheric ozone shield, are still controversial.
A validation of the models requires a.o. the determination of concentration profiles of many different chemical species, molecules and radicals, in the atmosphere, which relies to an important extent on infrared (IR) spectroscopic techniques.

The analysis of the atmospheric IR spectra and their interpretation in terms of concentration profiles demand an extended knowledge of very accurate spectral parameters like line position, line intensity and their variation as a function of pressure and temperature (altitude).

The JRC has continued to contribute to this knowledge using an IR tunable diode laser spectrometer, a laboratory technique which permits to evaluate high resolution spectral data in very specific regions of the IR spectrum. During 1980 measurements of line positions with transition assignments (NH_3 ν_2 band), and pressure broadening (CH_4 ν_3 band) have been performed. Most efforts have been concentrated on the analysis of the ν_1 band of CF_3Cl as a first step of a study (conducted in cooperation with theoreticians) to validate computation models for the generation of some halocarbon IR spectra.

This activity will be continued within the framework of the Air Quality program as far as it is compatible with the JRC efforts in the new field of the application of IR techniques (using Fourier Transform Spectroscopy) for photochemical reaction studies.

Table II. Mutagenic activity* of environmental S-PAH
(*) Mutagenic tests were performed by "Biochem. Institut für Umweltcarcinogene" and the University of Münster

Compound	Formula	Mass	Structure	Activity	Occurrence
Dibenzo/b,d/thiophene	$C_{12}H_8S$	184		weak	coal conversion effluents, tobacco smoke
Phenanthro/4,5-bcd/thiophene	$C_{14}H_8S$	208		weak	carbon black, coal combustion and conversion effluents
Benzo/b/naphtho/2,1-d/thiophene	$C_{16}H_{10}S$	234		weak/inactive	diesel exhaust, coal tar derivatives, lubricating oils, coal conversion effluents
Benzo/b/naphtho/1,2-d/thiophene	$C_{16}H_{10}S$	234		weak/inactive	
Benzo/2,3/phenanthro/4,5-bcd/thiophene	$C_{18}H_{10}S$	258		potent mutagen	coal tar, coal combustion and conversion effluents
Chryseno/4,5-bcd/thiophene	$C_{18}H_{10}S$	258		(under study)	
Triphenyleno/4,5-bcd/thiophene	$C_{18}H_{10}S$	258		weak	
Dinaphtho/2,1-b; 1',2'-d/thiophene	$C_{20}H_{12}S$	284		weak	

Chemical products (Organics)

Environmental carcinogens

A number of heterocyclic PAHs were detected in specimens of fossil origin and their structure identified.
Consequently, mutagenic testing of a set of sulfur containing compounds of the polycyclic aromatic hydrocarbon type (2 to 4 aromatic + 1 thiophene ring), (see table II), which occur regularly in environmental and industrial samples, was initiated and as a result, a strong mutagenic activity was found for a thiophene analogue of benzo [a] pyrene, which may be of technical importance especially in coal conversion processes.

Occupational carcinogens/Toxic chemicals

The second stage of a circular analysis on migration of selected antioxidants from a polymer which is widely used in food packaging (high density polyethylene) organised by JRC Petten under participation of seven expert laboratories from the member countries, was completed and evaluated successfully.
In a complementary study it was demonstrated that the concept of charge-transfer complex formation may be used to advantage in order to reduce pollution risks from toxic plastic additives.

Air quality

This project, which is aiming on the study of "Environmental Chemicals" related to air quality, was in 1980 mainly concerned with a continuation of the former project on "particle formation".
The problem of particle and of photochemical ozone formation has been attacked along 4 main lines with the following results:

1. For the estimation of a contribution to the formation of particles via gas-particle reactions, **the emission of organic materials from different tress**, especially of terpenes from evergreens, was determined. Terpenes and other olefinic compounds would give particles by reaction with ozone and by degradation processes due to sunlight. The quantitative determination of the terpenes and isoprenes, refined during 1980, has shown that essentially the same emission rates for these compounds have been found as in similar work in the U.S.A.

   Our findings can be summarized in the following scheme:
   natural organic compounds (emitted from trees. Po Valley)

terpenes	$\leqslant$ 0.1 ppb
alcohols	not detected
isoprene	~ 0.1 ppb

   terpenes emitted from PINE 4-100 $ng.g^{-1}min^{-1}$ (dry weight)
   (temp. dependent; day and night) mean value: 60 $ng.g^{-1}min^{-1}$
   isoprene (deciduous trees) 30-300 $ng.g^{-1}min^{-1}$ (U.S.A.)
   (light, temp. dependent)

   The influence of this amount of organic material to the composition of particles in a certain area, resp. its mass contribution, can not be estimated yet. Results from the analysis of extracts of the organic part of collected aerosols showed anyway no difference between urban and semi-rural locations. Seasonal variations could be related to the influence of domestic heating.

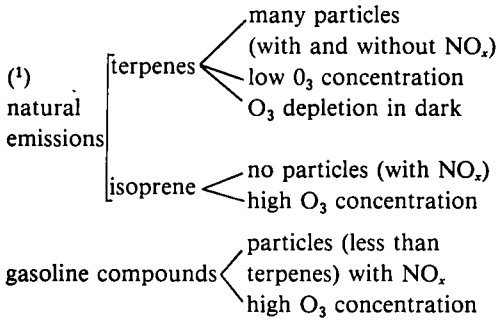
2. The **study of the size distribution of the airborne aerosols** in different areas and under different atmospheric conditions could eventually give an idea of particle forming and particle growing processes.
   Therefore such distributions were measured at different hours of the day, during night-time, and in special weather conditions like "Foehn"-events and severe haze-situations and compared among them.
   Bimodal distributions were always found with shifts for lower sizes during day-time and at "Foehn"-events (ex-

cellent visibility with bright sunshine) and to bigger particle sizes during night and in haze episodes (bad visibility with diffuse sunlight). One could conclude, therefore, that this behaviour indicates gas to particle processes during hours of intense sunlight due to photo-oxidation reactions, but the influence of primary emissions on the size pattern is unknown and difficult to substract.

3. A field of major effort, also for the future, is the **study of chemical and photochemical reactions under almost environmental conditions**, i.e. at ambient concentrations levels of pollutants and with sunlight as irradiation source. Teflon bags of one to several cubic meter volume are used for the experiments (Tedlar film has been abandoned at least for photochemical experiment due to impurity problems) after the mechanical strength of the delicate teflon-film sealing has be improved and the film material showed only very little volatile organic impurities (< 2 ppb).
Experiments with plant emissions from different trees and other vegetation and with single terpenes in the presence or not of nitrogen oxides were carried out and the results compared to those with unburnt gasoline with respect to particle and ozone formation. Terpenes, belonging to the olefinic compounds, are in the first reaction step rather consuming ozone, than creating it and give rise to larger quantities of particles than gasoline vapour. Gasoline, as a major contribution from human activity, is more efficient in ozone production, but exact quantification has not yet been achieved.

   In a simplified way our results can be summarized in:

   photochemical reactions in bags



(1) An EPA report (EPA 600/3/79/081) based on natural emission estimates and on photochemical reactions in bags similar to those we measured, indicates that, in precence of NO_x < 0.1 ppb (background level of clean air) th ozone production cannot be more than 2 ppb (photochemical model).

4. In order to understand the variations of ozone and particle concentrations in the real atmosphere **field measurements** of important pollutants were continued during 1980 at our ground station in Ispra. In addition, a measuring site was installed in a woody area of the JRC to study eventual local phenomena of particle formation together with ozone centration changes.
   Airborne measurements have been performed for ozone, oxides of nitrogen, sulphur dioxide and on a limited scale for particles on two fine weather days in the Netherlands for comparison with 1978/1979 data from the Po Valley. Flights of late 1979 in the latter area were unfortunate with regard to weather conditions and the results confirmed only already known general behaviour patterns of ozone and particles.

5. For the new research direction, the chemical and photochemical behaviour of "**Environmental Chemicals**" in the atmosphere the Infrared-Fourier Transformation Spectrometer was set-up and first test measurements were carried out in late 1980. The construction of a longpath photochemical reactor, to be coupled with the instrument, is under way.

6. **Mutagenicity tests** on some samples of organic extracts of different types of aerosols gave indications for the use of such a method in the search for a screening test for the harmfulness of new environmental chemicals.

Water quality

This research is concerned with the prediction of the "Nutrient Mass balance in acquatic ecosystems" by mathematical modeling and with the assessment of the ecological effects of chemical pollution ("bioindicators"). These activities are only losely linked and performed by separate research teams.

As a follow up of a former large scale project on "eutrophication" attention now has been focused to the study of the influence of **phosphorous release from sediments** (internal phosphorous loading) on phytoplankton growth.

This includes comparison between two lacustrine ecosystems with different characteristics: the Ponte Tresa basin (max. depth ~ 50 m) and the Agno bay (max. depth ~ 90 m) of Lake Lugano. The studies devoted to Ponte Tresa basin have been completed during 1980.
Experimental investigations have covered the whole yearly evolution, i.e. the thermal stratification period (~ 120 d, between June and October 1979) and the total mixing period (~ 240 d, between October 1979 and June 1980).
On the basis of biømonthly survey concerning the various components of the Phosphorus budget, the following experimental results have been obtained:

— Average Phosphorus net release rate from sediment during thermal stratification ~ 50 mg P $m^{-2}d^{-1}$;
— Average dissolved Phosphorus diffusion rate from hypolimnion to the euphotic zone during thermal stratification ~ 30 mg P $m^{-2}d^{-1}$ (this constituted ~ 90% of the Phosphorus sustaining observal algal blooms during summer 1979);
— Total Phosphorus loss by sediment during the year June 1979 - June 1980 2 tonn.

The eddy diffusion coefficient at the interface between hypo- and epilimnion has been drawn, via heat transfer model, from temperature measurements automatically performed at the limnological buoy on Lake Lugano.
A correlation established among a vertical box interaction

model and experiments has given satisfactory agreement with the above listed results, allowing deeper insight into the various processes affecting the Phosphorus mass balance in a lake.

Ecological effect of chemical pollution

To evaluate the effects produced by Cd ($CdCl_2$) and Al ($Al_2(SO_4)_3$) on freshwater communities under semi-natural conditions ("microecosystem" or "enclosure" method) two series of experiments have been carried out in a shallow lake (Lake Comabbio, Northern Italy).

From the analyses done inside and outside of the plastic enclosures (fig. 1) it is evident that in few hours Al flocculated the bioseston (algoe and bacteria). As a consequence, the water transparency increased and the chlorophyll concentration was strongly reduced. Zooplankters did not seem to be significantly influenced by Al. After 3 weeks from the beginning of the experiment the effect of this metal resulted attenuated. On the other hand the evaluation of the effects on the ecological community structure will be possible only after the quantitative counting of plankters will be completed. It is now evident that caution should be taken in restoring eutrophicated lakes by direct addition of Al salts. The results obtained with Cd confirmed the high toxicity of this metal for plankton already evaluated in a preeceding experiment.

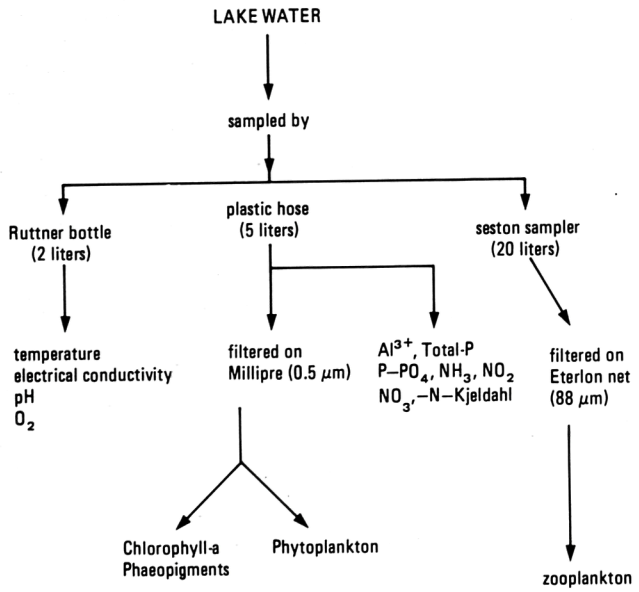


Fig. 1. Scheme of the physical, chemical and biological analyses carried out on water samples collected inside and outside the enclosure. In brackets are reported the water volumes collected

Isotopic lead experiment (I.L.E.)

I.L.E. is a large-scale, non-radioactive tracer experiment, using, as anti-knock compound added to petrols, a lead from Australian Broken Hill mine of an isotopic composition (Pb-206/Pb-207 = 1.04) significantly different from the lead encountered in the environment of the test area (Pb-206/Pb-207 = 1.18) at the beginning of the project. The primary goal of the I.L.E. experiment is to determine the fraction of automotive lead in human blood. Other objectives are the determinations of the pathways of automotive lead through air, vegetation, soil, food and, possibly, its distribution in the human body.

The test area is the Region of Piedmont in Northwest Italy. The exchange of the lead in petrols started in Autumn 1975 and ended in March 1977.

The steady phase with almost 100% exchange began in April 1977 and was completed in October 1979. From the beginning of 1980 the ratio in petrol lead was reverting gradually to the former value. The sampling has been focused on the central part of the test area, namely the city of Turin and its surroundings to a 40 km radius. The sampling plan included refineries, petrol stations, atmospheric particulate, rain, snow, soil, vegetation, food and blood. The montly sample rate was about of 200. The samples were analysed for their isotopic composition and all airborne filters and blood samples were also analysed for their total lead content.

The human population has been choosen in a way that the majority of the individuals be available for blood sampling throughout the period of the project. Another group consisted of children whose blood could only be sampled once.

The results obtained until now are summarized in the figure 2, which shows the behaviour of the Pb-206/Pb-207 ratio during the experiment.

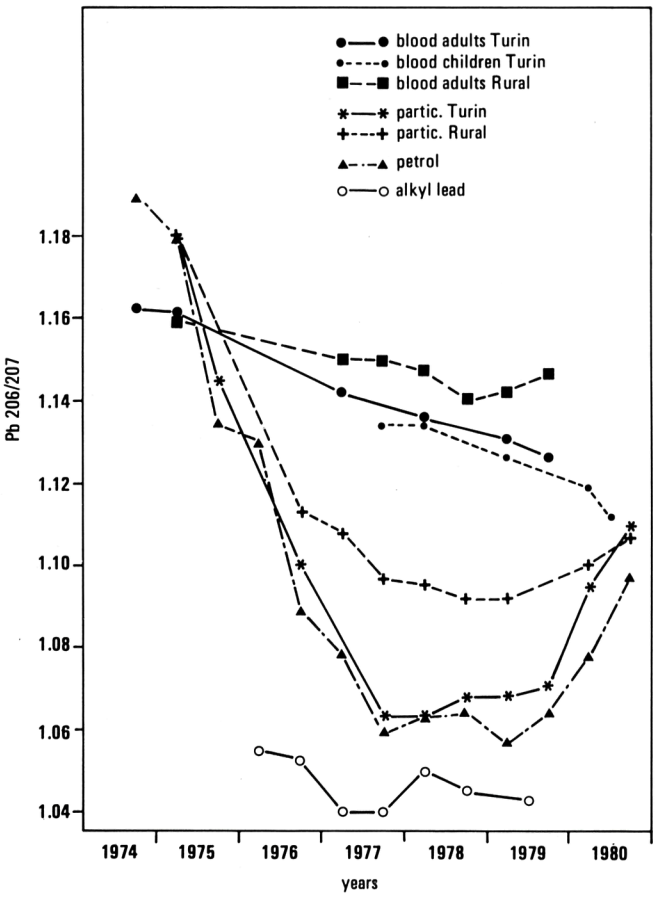


Fig. 2. Pb 206/207 ratio (ILE)

The progression of the ratio for alkyl-lead and the petrols is clearly reported. For the airborne particulate we had, during the steady-state phase, two levels of values, one for rural localities of about 1.09 and one for Turin of about 1.06. This last value shows that in the city there was, for the atmosperic particulate, a variation in the isotopic ratio similar to that of petrol. As far as the blood in concerned there has been a fall in isotopic ratio, both from Turin and from country districts, which is a substantial fraction of the fall in the ratio in the airborne particulates. The trends seem to indicate a continuing fall in adult blood from '78 to '79 although the fall in ratio in air was complete by the end of '77. The isotopic ratio in children (4-10 years) in Turin from '77 to '79 was slightly less than in adults. It is to be hoped that further measurements will permit some more definite conclusions.
For the future it is foreseen to continue measuring isotopic ratios in blood from Turin and from the country sites until they revert to values close to the pre-experiment values. The analysis must be extended also to the postmortem samples of the bone and other tissue, to dietary samples and to the various environmental samples.

Exposure to heavy metal and health effects

This research started in 1977 with a project on the "Mobilization of Heavy Metals (HMs) from coal fired power plants (CFPPs), potential ecological and biochemical implications" was completed with the development and the application of a dynamic environmental model (system analysis) to predict the time-dependent movement of HMs from CFPPs in the different environmental compartiments.

The results have been summarized in four reports. They contain the necessary informations for future long term predictions on the amounts of HMs released on the territory of each Member State through atmospheric stack emissions and disposal of ash identifying research priorities aimed at filling energy needs safely.

The long term predictions based on the amounts mobilized indicate that one can be optimistic in predicting no detectable or a slight impact on air, soil and groundwater. However, the current available informations on the release are largely incomplete ignoring fundamental aspects such as the evaluation of the physico-chemical forms of HMs which ultimately determine transport and toxic effects on the environment and man. This limits the validity of the conclusions about a probable little impact on the environment and human health and should be matter of urgent future research.
The assessment studies have been extended to problems such as HMs from phosphatic fertilizers and incinerators in order to evaluate the relative contribute of each HMs pollution source to the total human exposure. A first relative evaluation show that HMs from fertilizers, particularly Cd, Se, Mo and U, contribute to the increase of HMs released to soil during the production of electrical energy from coal-fired power plants. The contribute of Cd, for instance, on groundwater quality is significantly higher in the case of fertilizers relatively to the Cd emitted from CFPPs (see fig. 3).

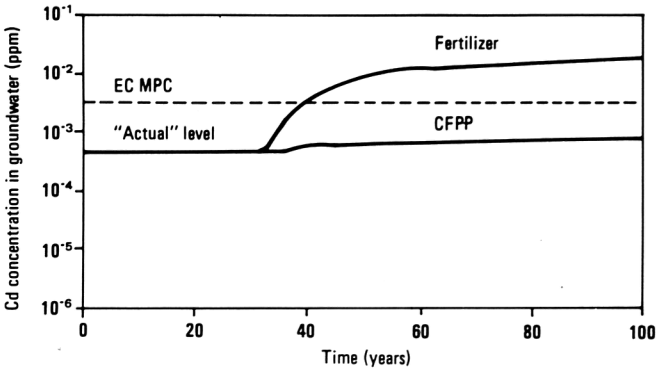


Fig. 3. Calculated long term increase of Cd in groundwater as result of a continuous agricultural practice (fertilizer) and stack emission from a coal fired power plant (CFPP), EC, MPC.
EC - maximum permissible concentration

The metallobiochemical activity, not significantly changed for the 1980 - 1983 period, has been oriented towards new aspects such as the comparison of the metabolic behaviour of current environmental levels of HMs in different animal species and man (exposed and unexposed population). Considerable progress has been done in the environmental toxicology research towards the metabolic pathways of low levels of V, As, Tl and Cd. Metabolic patterns of As in rats and rabbits and the determination of Cr in biopsies of exposed workers are the main results concerning the new aspect of the research. Marked species differences on the metabolic patterns of As at tissue, intracellular and molecular levels were observed in rats and rabbits suggesting that the rabbit may be a more appropriate animal model than the rat when the results on the metabolic fate of As should be compared and possibly extrapolated to man. The concentration of Cr and of other 16 elements was determined by NAA in the nasal mucosa biopsies of 20 occupational subjects in the different working areas of a super-refined Fe-Cr plant. The concentrations of Cr found in the nasal mucosa were linearly correlated to the concentration of Cr in the ambient air at the working place while non specific correlations were found with histological alterations. This suggests that Cr is accumulated in the nasal mucosa of exposed workers as a result of the deposition from inhaled air. Increasing concentrations of Cr results in a significant increase of Co and Cs and a decrease of Ag.

Environmental impact of conventional power plants

This activity represents the follow-up of studies which were undertaken in recent years and progressively unified under the general theme "Remote sensing of pollution phenomena around intense localized sources". Techniques and methods developed in this frame constitute a proven structure for applications **in field**, as shown by joint participation of JRC teams in national or European campaigns. Four laboratories with different measuring techniques are contributing, namely: Correlation Spectroscopy (COSPEC and TELETEC); LIDAR; Micrometeorology; Tracers.

The activities of these units for 1980 can be summarized as follows:

— **Elaboration of data from the CEC Campaign** (Turbigo plant, Italian Electricity Board, ENEL, 1979) for a systematic description of pollutant emission and dispersion around a typical 1300 MW oil-fuelled power plant. The results have been assembled in a final report in press (ENEL and CEC - D.G. XII Editors).

— **Mass balance investigations combining LIDAR and COSPEC measurements.** Joint application of light scattering and absorption techniques has been tested in a series of exercises around a power plant. Possibility of obtaining a comparative description of aerosol behaviour vs. gaseous behaviour in the emitted plumes has been proven.

— **Tracers experiments.** Double tracers experiments (SF_6 + CF_2 BR_2) have been performed in two campaigns at KFK Karlsruhe (in collaboration with German teams) and at ENEL Turbigo. The possibility to monitor pollutant dispersion from a system of multiple sources has been satisfactorily tested. Study for the application of new tracers (perfluorocarbons) to mesoscale dispersion is progressing.

— **Mobile laboratory for mapping of gaseous pollutants.** The assembly of this unit has been completed; performance tests have been begun with a series of exercises around the urban area of Milano (collaboration with the Brera Meteorological Observatory, Milano). Attached figure 4 shows determination of the vertical SO_2 burden, measured on a closed path around the city.

— **Micrometeorology.** By the use of SODAR and radiosonde investigations, the build-up and decay of nocturnal inversion layers as well as of local air flow patterns around Ispra could be described. This information can be applied to the estimation of vertical and horizontal dispersion of pollutants.

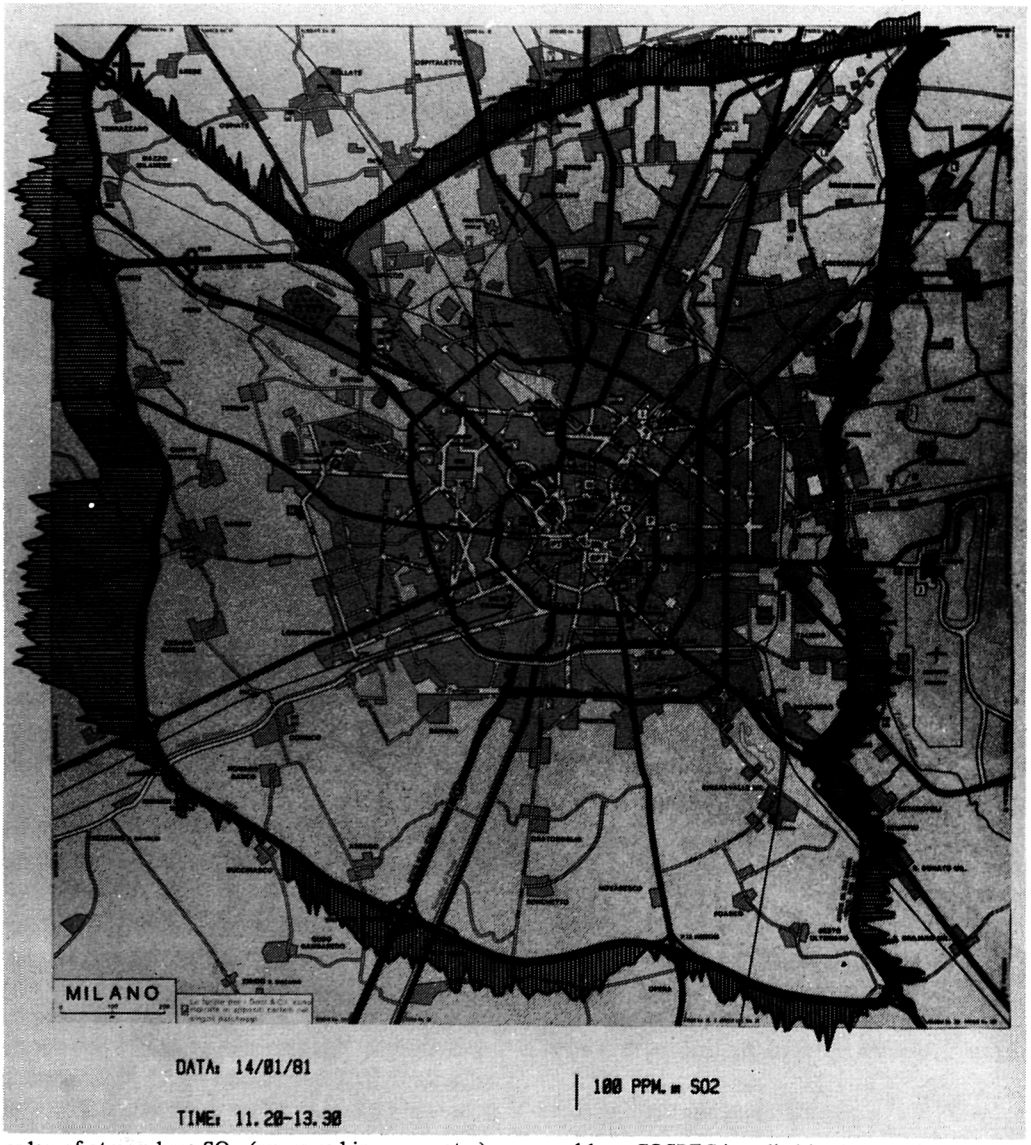


Fig. 4. Vertical burden of atmosphere SO_2 (expressed in ppm-metre) measured by a COSPEC installed in the mobile mapping laboratory during a survey around Milano city (January 14, 1981; 11.30 - 13.20 LMT; westerly wind above a urban heat island. Sampling rate 100 m)

3. CONCLUSIONS

The ECDIN project has taken a further step towards an operational data base system with the completion of the programme for checking new data and updating the ECDIN ADABAS data base. The inplementation of a programme to control and facilitate EURONET access to ECDIN has removed some of the technical barriers to the initiation of the experimental ECDIN service later this year.
Preparation for the supplementary reporting phase of EINECS is well underway. The file of chemical synonyms to be used as a basis for the core inventory and the Compendium of Known Substannces will also become part of the ECDIN data base. It is to be expected that this will substantially increase the use of ECDIN during 1981.

Activities on the Analysis of Organic Micropollutants were successfully concluded during the year. The scientific/technical know-how has been transferred to the new projects "Indoor Pollution" and 'Air Quality". The Petten activities on Organic Chemical Substances were oriented towards the new Environment Programme. The identification of a strong mutagenic agent with a structure similar to benzo [a] pyrene in coal derivatives is of considerable interest for the environmental assessment of future coal conversion processes and of significance for theoretical studies relating chemical structure with mutagenic or carcinogenic activity.

The research activities on "Particle Formation" were merging to the new project "Air Quality" with more emphasis on the study of photochemical reactions of environmental chemicals. The implementation of a new IR-FFT multipath cell system was an important milestone in this direction.

Activities on "Water Quality" have been reoriented towards specific studies on internal load of phosphorus in eutrophical fresh water bodies. It is now proved for shallow lakes that internal load from sediments is the controlling parameter for algal growth in the summer period. The concept of enclosures (well defined "Microecosystems") for the study of ecological effects on chemical pollution in fresh water ("bioindicators") has been confirmed.

The successful end of the I.L.E. project has now come in sight. The isotopic value 206/207 of lead in blod has dropped from initially 1.16 to 1.13 for adults in urban areas and is somewhere in between for rural districts.
For further validation of the experimental data sampling and analyses will go on a small rate for gasoline, blood and other media.

The project on Mobilization of Heavy Metals from coal fired power plants indicated interesting conclusions and a rich harvest of scientific results in the field of metallobiochemistry. The work has been continued with a broader and more complete approach considering the impact of other sources of heavy metal pollution like **fertilizers** and **incinerators** as well.
Expected mobilization of heavy metals from coal fired power stations in the EEC countries will still be very low in 1985 and by far under proposed environmental standards. On the other hand the first results suggest that the long term contribution of trace metals in fertilizers indicate a potential hazard for Cd, Se, Mo and U.

The project on "Environmental Impact of Conventional Power Plants" disposes now of a well established and recognized set of techniques for the study of transport and diffusion of pollutants from power plants (point sources).
The orientation towards mass-balance studies of larger aereas and mesoscaletransport is on the way.

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